1   1.   A method for preparing a substrate for detecting at least one
2 analyte in a sample comprising the steps of:
3   a) exposing the sample to at least two different selectivity
4 conditions, each selectivity condition defined by the combination of an adsorbent and an
5 eluant, to allow retention of the analyte by the adsorbent;
6   b) identifying by desorption spectrometry at least one selectivity
7 condition under which the analyte is retained; and
8   c) preparing a substrate comprising at least one adsorbent of an
9 identified selectivity condition.

1   2.   The method of claim 1 wherein the step of identifying comprises
2 identifying at least one selectivity condition under which a plurality of analytes are
3 retained.

1   3.   The method of claim 1 wherein the step of preparing comprises
2 preparing a substrate comprising a plurality of adsorbents that retain the analyte under an
3 elution condition as a multiplex adsorbent.

1   4.   A method for progressively identifying a selectivity condition with
2 improved resolution for an analyte in a sample comprising the steps of:
3   (a) identify a selectivity condition that retains an analyte in a
4 sample by:
5   (i) exposing a sample to a set of selectivity conditions, each
6 selectivity condition defined by at least one binding characteristic and at least one elution
7 characteristic;
8   (ii) detecting analyte retained under each selectivity
9 condition by desorption spectrometry; and
10   (iii) identifying a selectivity condition that retains the
11 analyte; and
12   (b) identifying a selectivity condition with improved resolution for
13 the analyte by:

14   (i) selecting at least one binding characteristic or elution

15   characteristic from the identified selectivity condition and adding it to a selectivity

16   characteristic constant set;

17   (ii) exposing the sample to a modified set of selectivity

18   conditions wherein each selectivity condition in the modified set comprises (1) the

19   selectivity characteristics in the constant set and (2) a binding characteristic or elution

20   characteristic that is not in the constant set; and

21   (iii) identifying a selectivity condition from the modified set

22   by desorption spectrometry that retains the analyte with improved resolution compared

23   with a prior identified selectivity condition.

1   5.   The method of claim 4 further comprising the step of repeating step

2   (b) at least once.

1   6.   The method of claim 5 comprising repeating step (b) until a

2   selectivity condition is identified that retains only the target analyte from the sample.

1   7.   A substrate for desorption spectrometry comprising an adsorbent

2   from a selectivity condition identified to resolve an analyte by the method of claim 4.

1   8.   The substrate of claim 7 in the form of a kit further comprising an

2   eluant from the selectivity condition or instructions on using the eluant in combination

3   with the adsorbent.

1   9.   A method for determining whether an analyte is differentially

2   present in a first and second biological sample comprising the steps of:

3   a) determining a first retention map for the analyte in the first

4   sample for at least one selectivity condition;

5   b) determining a second retention map for the analyte in the second

6   sample for the same selectivity condition; and

7   c) detecting a difference between the first and the second retention

8   maps;

9   whereby a difference in the retention maps provides a determination

10   that the analyte is differentially present in first and second samples.

1   10.   The method of claim 9 wherein the first biological sample derives

2   from a healthy subject and the second biological sample is from a subject suffering from

3   a pathological condition.

1   11.   The method of claim 9 wherein the biological samples comprise

2   first and second cell extracts.

1   12.   The method of claim 9 wherein the retention map comprises a

2   plurality of selectivity conditions.

1   13.   The method of claim 9 comprising, before the step of detecting, the

2   step of converting the analyte into at least one fragment whose molecular mass smaller

3   than the mass of the analyte.

1   14.   The method of claim 9 wherein the step of detecting a difference is

2   performed in a programmable digital computer.

1   15.   The method of claim 9 for determining whether an agent alters the

2   expression of a protein in a biological sample further comprising the step of

3   administering the agent to a first biological sample but not to a second biological sample.

1   16.   The method of claim 10 wherein the sample is selected from the

2   group consisting of blood, urine, serum and tissue.

1   17.   The method of claim 10 further comprising identifying an analyte

2   that is present in a greater amount in second biological sample than in the first biological

3   sample, whereby the analyte is identified as a candidate diagnostic marker for the

4   pathological condition.

1   18.   The method of claim 11 wherein the first cell extract is derived

2   from a healthy cell and the second cell extract is derived from a cancer cell.

1   19.   A method of diagnosing in a subject a disease characterized by at

2   least one diagnostic marker comprising the steps of:

3   a) providing a substrate for use in desorption spectrometry that

4   comprises at least one addressable location, each addressable location comprising an

5   adsorbent that resolves at least one of the diagnostic markers under an elution condition;

6   b) exposing the substrate to a biological sample from the subject

7   under the elution condition to allow retention of the diagnostic marker; and

8   c) detecting retained diagnostic marker by desorption spectrometry;

9   whereby detecting retained diagnostic marker provides a diagnosis

10   of the disease.

1   20.   The method of claim 19 wherein diagnosis involves detection of a

2   plurality of diagnostic markers and the addressable locations comprise adsorbents that

3   resolve the plurality of diagnostic markers.

1   21.   A kit for detecting an analyte in a sample comprising (1) a

2   substrate for use in desorption spectrometry that comprises at least one addressable

3   location, each addressable location comprising an adsorbent that resolves an analyte

4   under a selectivity condition comprising the adsorbent and an eluant, and (2) the eluant

5   or instructions for exposing the sample to the selectivity condition.

1   22.   The kit of claim 21 for the diagnosis of a disease wherein the at

2   least one analyte is at least one diagnostic marker for the disease.

1   23.   The kit of claim 22 wherein the disease characterized by a plurality

2   of diagnostic markers and the substrate comprises a plurality of addressable locations,

3   each addressable location comprising an adsorbent that resolves at least one of the

4   diagnostic markers.

1   24.   The kit of claim 23 wherein at least one adsorbent is a multiplex

2   adsorbent comprising adsorbent species that each retain at least one diagnostic marker.

1   25.   The kit of claim 23 wherein at least one adsorbent does not

2   comprise a biopolymer.

1   26.   The kit of claim 23 wherein at least one addressable location

2   comprises a ligand specific for a diagnostic marker.

1   27.   The kit of claim 26 wherein the ligand is an antibody.

1   28.   A substrate for desorption spectrometry comprising at least one

2   adsorbent in at least one addressable location wherein the at least one adsorbent resolves

3   a plurality of diagnostic markers for a pathological condition from a patient sample.

1   29.   The substrate of claim 28 wherein at least one adsorbent does not

2   comprise a biopolymer.

1   30.   The substrate of claim 28 wherein one adsorbent resolves the

2   plurality of diagnostic markers.